"... white and azure, laced
With blue of heaven's own tint."
Cymbeline, ii. sc. 2.

"Whose ranks of blue veins."—*Lucrece*.

"Those blue-veined violets."—*Venus and Adonis*.

"Where fires thou find'st unraked, and hearths unswept
There pinch the maids as blue as bilberry."
Merry Wives of Windsor, v. sc. 5.

"And *Hony soit qui mal y pense* write
In emerald tufts, flowers purple, blue, and white,
Like sapphire, pearl, and rich embroidery."—*Ibid.*, v. sc. 5.

Here there is no confusion. The comparisons are exact and beautiful. Again we have—

"When wheat is green, when hawthorn buds appear."
Midsummer Night's Dream, i. sc. 1.

The season indicated shows there was no confusion between green and *brown*.

We must not forget the well-known song—

"When daisies pied and violets blue,
And lady-smocks all silver white,
And cuckoo-buds of yellow hue
Do paint the meadows with delight."
Love's Labour Lost, v. sc. 2.

And to conclude our comparisons of green and blue—

"... I will rob Tellus of her weeds
To strew thy green with flowers: the yellows, blues,
The purple violets, and marigolds,
Shall as a chaplet hang upon thy grave."
Pericles, iv. sc. 1.

Returning to the colour of eyes. Shakespeare not only knew a blue eye, but could discriminate, and appreciate the beauty of a grey eye—a shade which often does duty for blue. The lovely rivals Julia and Sylvia are so endowed—

"Her eyes are grey as glass—and so are mine."
Two Gentlemen of Verona, iv. sc. 4.

"... Thisbe, a grey eye or so."
Romeo and Juliet, ii. sc. 4.

I think the above quotations afford good proof of the poet's correctness of colouring with regard to green and blue. It is true that he occasionally uses a small degree of licence with purple and blue, in the case of violets; but clearly not from unconsciousness of the difference. I cannot remember any instance where he confuses green with blue except purposely and humorously.

In the use of other colours Shakespeare is in most instances I am acquainted with equally true to nature. To give examples would occupy too much space; but if there are exceptions I have no doubt that your correspondents—now that the matter is broached—will be able to furnish them.

Sligo, January 10 EDWARD T. HARDMAN

Intellect in Brutes

THE following incident may interest some of the readers of NATURE, as affording evidence of the possession and exercise of reasoning power by a brute. During the present frost the window-sills of my drawing-room are supplied with bread for the benefit of the birds, who, finding food there, are constantly fluttering about the windows. One day a large water-rat was seen on the window-sill, helping himself to the bread. In order to reach the window he had to climb to a height of about thirteen feet: this he did by the help of a shrub trained against the wall. Neither instinct nor experience will easily account for his conduct: since he never found food there before. If neither experience nor instinct, what save reason led him? His action seems to have been the result of no small observation and reasoning. He seems to have said to himself—I observe the birds are thronging that window all day; they would not be there for nought; it may be they find there something to eat: if so, perhaps I too might find there something which I should like. I shall try.

Bardsea EDWARD GEOGHEGAN

OUR ASTRONOMICAL COLUMN

OLBERS' COMET OF 1815.—On March 6, 1815, Olbers discovered a small comet at Bremen, in about 49° right ascension, and 32° north declination, or between Perseus and Musca; it had an ill-defined nucleus and was not visible without telescopic aid. The first parabolic elements were calculated by Olbers himself, and he was followed by Bessel, Gauss, Triesnecker and others in the determination of similar orbits. Ephemerides founded upon them showed that the comet would be observable for a considerable period, and as the result proved observers were not negligent of this circumstance. Gauss, writing to Bode on April 24, alludes to the long visibility of the comet, and the probability that elliptical elements would be found, but this remark apparently was merely intended to imply that the grasp which a long course of observation would afford upon the orbit, might lead to an ellipse, not that Gauss had remarked any sensible deviation from parabolic motion; indeed he mentions that he had not then reduced his April observations. The first detection of the inadequacy of the parabola to represent accurately the comet's course, is due to Bessel: he had calculated parabolic elements from observations on March 11, April 11, and May 20, which, while agreeing well with the positions employed, gave the right ascensions sensibly too small from March 11 to April 11, and between April 11 and May 20, as decidedly too great, even to as much as 4′, and on May 26, the calculation was again many minutes in defect; these differences naturally induced Bessel to relinquish the parabolic hypothesis, and after some disappointment from the failure of the first method he employed, he communicated to Olbers on June 23 the elements of an elliptical orbit, in which the period of revolution was a little over 73 years. At the end of June Gauss deduced an ellipse with a period of 77 years, and soon afterwards Nicolai, then assistant to von Lindenau at Gotha, added a further confirmation of the elliptical character of the orbit, assigning a revolution of $72\frac{1}{2}$ years. On July 22, being in possession of observations to the middle of the month, Bessel improved upon his first calculation, and now found an ellipse with a period of 73·8968 years, which was made the foundation for his subsequent investigations, of which we have presently to speak. Thus was the periodicity of the comet established, and Bessel, after remarking upon the importance of the addition to the system (at that time Halley's comet was the only one that could be considered certainly periodical) he proposed that it should bear the name of its discoverer—Olbers.

Besides a long series of observations taken by Olbers himself, the comet was observed by Gauss at Göttingen, Bessel at Königsberg, Triesnecker at Vienna, Struve at Dorpat, Oriani at Milan, Lindenau at Gotha, Maskelyne at Greenwich, and Bouvard at Paris. Its distance from the earth continued pretty nearly constant (about 1·45) during the greater portion of the time it was visible, and at no period was it a conspicuous object; its nucleus was pretty bright at the beginning of May, and it then had a tail about 1° in length.

On the disappearance of the comet Bessel collected the observations which extended to August 25, the last having been made by Gauss at Göttingen; indeed, he was the only observer after July 25. He then commenced the work which is incorporated in his great memoir upon this comet, published in "Abhandlungen der königlichen Akademie der Wissenschaften in Berlin, 1812–13," a volume which was not published until 1816. He formed ten normal positions, in which all the observations appear to be brought to bear, excepting those at Greenwich and Paris, which were doubtless unknown to him. He corrects these normals for the effect of perturbations from the action of Venus, the Earth, Mars, Jupiter, and Saturn, during the comet's visibility, and by a fine series of observations of the sun at Königsberg between March 8 and August 29, 1815, he applies corrections to the sun's places obtained from Carlini's first tables. Equations of condition were then formed and solved on the method of least squares, and thus the following definitive elements of the comet's orbit in 1815 were obtained:—

Perihelion Passage, April 25·99867, M.T. at Paris.

Longitude of the perihelion	149° 1′ 55″·9	1815·0
,, ,, ascending node	83 28 33·6	1815·0
Inclination of the orbit to ecliptic... ...	44 29 54·6	1815·0
Excentricity	0·93121968	
Semi-axis major	17·63383	
Logarithm of perihelion distance	0·0838109	
Period of revolution	74·04913 years.	

Motion—direct.

These elements represent the normals upon which they are founded very closely, considering that observations of comets in 1815 did not pretend to the degree of precision which is now sought to be attained, and, moreover, were subject in the reductions to errors in the places of the comparison stars.

But Bessel's labours did not stop here. With a special interest in the comet of 1815, not, it may be presumed, alone due to its exceptional character, but in no small degree to the circumstance of its having been detected by his most intimate and revered friend, Olbers, Bessel undertook, and in the year of its appearance accomplished, the laborious task of computing the perturbations of the planets Jupiter, Saturn, and Uranus upon the motion of the comet during the present revolution, and so determining the epoch of the next perihelion passage. The principal details of this work are comprised in the memoir to which we have already referred. The masses of Jupiter and Uranus were Laplace's, while the mass of Saturn was taken from Bouvard's tables. The whole period is divided into three sections, the first extending from August 4, 1815, to July 30, 1833; the second from the latter date, with new values of the semi-axis and excentricity to July 21, 1869, and the second from July 21, 1869, to the next perihelion passage. The action of each of the three planets tends to accelerate the comet's return, that of Jupiter by upwards of two years; the final result indicating an acceleration of 824·51 days, with reference to the period belonging to Bessel's definitive ellipse for 1815; it was thus found that the duration of the actual revolution would extend to 26222·4 days, and consequently the next perihelion passage is fixed to February 9·4, 1887. This conclusion will be affected not only by the imperfect values of the planetary masses which were available when Bessel undertook the investigation, but in a greater degree by the uncertainty which still remained as to the precise length of the revolution at the last appearance; this Bessel found to extend to ± 0·27657 of a year, or 101 days.

With such an amount of probable error attaching to Bessel's result it must soon be a matter for the consideration of the astronomer, whether a nearer approximation may not be yet attained. We have much more accurate values of the masses of Jupiter, Saturn, and Uranus than Bessel possessed, and are able to take into account the influence of Neptune, though this is not likely to be very material. Fortunately, in several series of observations, the observed differences of right ascension and declination between the comet and the comparison stars are preserved to us, and thus we can reduce the observations anew, with much improved positions of many of the stars and with modern elements of reduction. The series of observations thus available include the long one of Olbers (*Berliner astronomisches Jahrbuch*, 1818), and those of Greenwich, Paris, and Dorpat. It is a work which, together with the recalculation of the perturbations to the next perihelion passage, may perhaps be made the subject of a prize by one or other of our scientific academies; on the last return of Halley's comet, the first approximation to the epoch of arrival at perihelion was due to action of this kind on the part of the Academy of Turin, and though a much higher degree of interest attached to the reappearance of that famous body, we do not despair to see Olbers' comet deemed worthy of a new and more refined calculation.

If these cometary bodies wandering into the confines of the solar system from the stellar spaces are fixed therein by the action of one or other of the planets, it will have been owing to a very close approach to the planet Mars that Olbers' comet presented itself in 1815, moving in an ellipse of moderate dimensions. The nearest approach of the two orbits in that year was 0·07 in 86°·4 heliocentric longitude, but this distance must have varied in successive revolutions through the perturbations of the other planets, and at some past time there may have been an intersection of the orbits and a close encounter of the two bodies.

METEOROLOGICAL NOTES

BEFORE the commencement of the summer rains this year Mr. Eliot, the officiating meteorological reporter to the Government of India was called upon for a report on the prospects of the season. His reply, to which we have already referred in the "Notes," consisted of a short *résumé* of the most important characteristics of the south-west monsoons of recent years, from which the following conclusions were deduced:—"1. The persistent excessive pressure over Northern India at the present time (June, 1878), tends to diminish the baric gradient between Southern Asia and the Mid-Indian Ocean, and if this is not compensated by increased pressure over the sea area to the South of India, the monsoon current will be below its average strength. 2. There appear to be no strongly-marked abnormal variations of pressure over Northern India. It is therefore probable that the rainfall will be much more equally distributed than last year. 3. Comparing the present year with 1865, it is probable that the heavy rainfall during the cold weather, and more especially in May, will slightly retard the advent of the monsoon in Upper India. 4. The probable effect of the low pressure along the Bombay coast cannot be determined except by comparison with last year. It appears to promise fairly abundant rain over that portion of the country." These conclusions have now been subjected to the test of experience and are found to have been verified in almost every particular. The southerly current from the Indian Ocean has been decidedly below its normal strength; the rains set in from a fortnight to a month after the usual time; every district in the country has received a moderate supply of rain, though the average rainfall for the whole country has been less than usual, and over the Bombay Presidency, from Belgarum to Kurrachee, the rainfall has been in excess of the average for previous years. The only peculiarity of the monsoon of 1878, that was not predicted, was the frequent recurrence of heavy falls of rain over a few small and well-defined areas; but this would seem to be the character of the rainfall of every year in which the monsoon current is of less than the usual strength. The percentage of verifications reached by Mr. Eliot has thus been as great as that attained by the American observers, and the predictions in his case were made months, not days or hours, in advance. The same meteorologist has recently made a discovery which promises to be of the greatest possible value in connection with the system of storm-warnings to the ports round the Bay of Bengal. It is that a cyclonic vortex, when generated in the middle of the Bay, always travels towards that part of the coast where the wind velocity for the time being is least in comparison with the average velocity for the same place and time of year. This law has been verified by almost all the cyclonic disturbances that have occurred in the Bay since a chain of meteorological observatories was established round it, and it lends a great deal of support to the theory that a cyclonic vortex is developed through the accumulation, concentration, and condensation of aqueous vapour over a region of comparative calm. All that appears now wanted to